CASE REPORT

Acute Motor Axonal Neuropathy with Hyperreflexia in a Child: A Case Report

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Acute motor axonal neuropathy (AMAN), a variant of Guillain-Barré syndrome (GBS), is characterized with acute paralysis and loss of reflexes. This was a case report of AMAN patient presenting with paraparesis and hyperreflexia. We reported a 1-year-11-month-old boy hospitalized with history of two weeks of progressive ascending paralysis. He had upper respiratory tract infection four weeks prior to the onset of weakness. Physical examination showed paraparesis with exaggerated tendon reflexes; furthermore, he was evaluated for spinal cord lesion, which showed normal MRI spine. Lumbar puncture showed CSF cytoalbuminologic dissociation. Moreover, nerve conduction studies showed motor axonal degeneration. His clinical signs improved spontaneously and complete recovery at eight weeks after the onset of weakness. This case implied the clinicians' extra attention for GBS with hyperreflexia and paraparesis.

Keywords: *Acute motor axonal neuropathy, Guillain-Barré syndrome, Tendon reflex, Hyperreflexia, Anti-gangliosides antibody, Campylobacter jejuni*

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Guillain-Barré syndrome (GBS) is an immune-mediated polyneuropathy that is one of the most common causes of acute flaccid paralysis. GBS, with its own specific characteristic in both clinical symptoms and neurophysiology, mostly presents with acute areflexia paralysis, albuminocytologic dissociation, and/or abnormal nerve conduction[1,2].

Regarding the pathogenicity of GBS, one proposed mechanism is the molecular mimicry between gangliosides and antecedent infectious agents. The most frequently identified infectious agent associated with GBS is *Campylobacter jejuni*, which is attributed for 30%. Other infectious agents with well-defined relationship to GBS are Epstein-Barr virus, Cytomegalovirus, Varicella-zoster virus, and *Mycoplasma pneumoniae*[1,2]. GBS has numerous variants, the most common is the acute inflammatory demyelinating polyradiculoneuropathy (AIDP). Acute motor axonal neuropathy (AMAN), acute motor and sensory axonal neuropathy (AMSAN), and Miller-Fisher syndrome are other well-known types of GBS[3]. The AMAN with normal or brisk tendon reflexes has been recently described in China and in Western countries[4]. Previous reports showed the association of AMAN with hyperreflexia and *C. jejuni* infection, and anti-gangliosides antibodies (anti-GM1 and anti-GD1a)[2]. In the present paper, we reported one pediatric patient diagnosed as having AMAN with hyperreflexia. It is noteworthy that only few cases were reported in children.

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Case Report

A 1-year-11-month-old boy developed progressive ascending paralysis for two weeks. He had walking difficulties, and his symptoms worsened before admission. He had history of upper respiratory tract infection four weeks prior to the onset of weakness.

On physical examination, vital signs were stable and no autonomic disturbance observed. Cranial nerves were normal. His motor strength in deltoids, triceps, biceps, wrist extensors, and flexors were 5/5 bilaterally; hip flexors, quadriceps, and hamstrings were 4/5 bilaterally; and dorsiflexors and plantar flexors were 3/5 bilaterally. Due to the lack of cooperation from the patient, the sensory examination could not be evaluated. However, there was no spasticity and the Babinski's sign and clonus were negative. The deep tendon reflexes were hyperactive (3+), and the cross adductus reflex was positive. There was neither sign of loose sphincter tone nor full bladder. The whole spine magnetic resonance imaging (MRI) was unremarkable. The lumbar puncture test was performed on admission. The cerebrospinal fluid (CSF) profile showed considerable albuminocytologic dissociation

and no sign of white blood cell (WBC) while the protein and the sugar concentration were 73 mg/dL and 61.4 mg/dL, respectively.

The nerve conduction study was carried out and showed moderately reduced amplitude of left median and tibial motor nerves with normal conduction velocity and distal latency (except the non-response on the sural nerve) as shown in Table 1 and 2. Unfortunately due to the laboratory limitation and financial problems, we were not able to either evaluate the CSF anti-gangliosides antibody or perform the stool examination to detect *C. jejuni*.

Based on all the observations and examinations, the patient was diagnosed as AMAN associated with hyperreflexia. After hospitalization, the weakness spontaneously recovered. Therefore, he did not receive intravenous immunoglobulin (IVIG) and later, he was discharged from the hospital. Follow-ups were done at 2-week and 4-week. Complete recovery was gained eight weeks following the onset of weakness. The post-discharge physical examination in all extremities showed grade 5/5 strength of his muscles but the hyperreflexia and cross adductus reflex persisted.

Discussion

The patient presented to our hospital with ascending paralysis along with hyperreflexia without other long tracts signs. He was first diagnosed as transverse myelitis. Subsequent to the CSF profile, which showed the typical pattern of GBS with albuminocytologic dissociation, the nerve conduction result, and normal MRI spine, he was diagnosed as AMAN.

The clinical features of AMAN are different from other variants of GBS, with less involvement of cranial nerve and exemplary pure motor neuropathy. It was previously shown that in 90% of patients with diagnosis of AMAN the sensory examination is normal[2]. In contrast to other variant types of GBS, especially AIDP, the deep tendon reflexes are usually preserved in AMAN, and some patients may develop hyperreflexia at the early stage or at the peak of illness.

Table 1. Motor nerve conduction studies

Nerve	Side	Stim	Record	Lat (ms)	Amp (mV)	Dur (ms)	Dist (mm)	CV (m/s)
Median	Left	Wrist	APB	3.03	2.39	4.49	55	n/a
		Elbow		5.33	2.97	4.57	80	34.8
Ulnar	Left	Wrist	ADM	1.97	0.39	3.70	50	n/a
		Elbow		3.43	0.29	4.00	94	64.1
Tibial	Left	Ankle	AH	3.53	1.01	4.53		n/a
		Pop. Fos		7.13	0.75	4.63	140	36.9
Peroneal	Left	Ankle	EDB	3.50	0.12	4.60		n/a
		Fib. Head		6.40	0.12	5.13	125	43.1
Tibial	Right	Ankle	AH	4.13	1.30	3.83	50	n/a
		Pop. Fos		7.40	0.97	4.73	150	45.9
Peroneal	Right	Ankle	EDB	4.43	0.16	4.47	50	n/a
		Fib. Head		7.60	0.12	4.20	135	42.6

ADM = abductor digiti minimi; AH = abductor hallucis; Amp = amplitude; APB = abductor pollicis brevis; CV = conduction velocity; Dist = distal latency; Dur = duration; EDB = extensor digitorum brevis; Fib. Head = fibula head; Lat = latency; n/a = not applicable; Pop. Fos = popliteal fossa; Stim = stimulation

Table 2. Sensory nerve conduction studies

Nerve	Side	Stim	Record	Lat (ms)	Amp (mV)	Dur (ms)	Dist (mm)	CV (m/s)
Median	Left	Wrist	Index	2.58	19.58	1.38	100	56.6
		Elbow		3.25	9.61	0.98	40	80.0
Ulnar	Left	Wrist	5th digit	1.90	12.26	0.73	70	60.0
Sural	Left	Mid. Calf	Ankle	NR				
Peroneal	Left	Lower leg	Dors. ft	2.12	6.14	1.52		
Peroneal	Right	Lower leg	Dors. ft	1.97	5.85	0.95		
Sural	Right	Mid. Calf	Ankle	2.28	5.15	1.27		

Amp = amplitude; CV = conduction velocity; Dist = distal latency; Dors. ft = dorsum of foot; Dur = duration; Lat = latency; Mid. Calf = middle of calf; n/a = not applicable; NR = non-response; Stim = stimulation

Only 10 to 20% of AMAN patients have the preserved or exaggerated deep tendon reflexes[2,5], which the clinical findings of our case presentation had.

The mechanism of AMAN with hyperreflexia without other pyramidal-tract signs is still unknown. The hypothesis to explain this feature includes the involvement of central nervous system (CNS), upper-motor-neuron, and the dysfunction of spinal inhibitory interneurons. The intramedullary branches of anterior horn cells increase the gangliosides and inflammation of the nerve roots, which leads to the disruption of blood-CNS barrier and binding of antibodies to gangliosides in the peripheral nerve of anterior horn cell. This intramedullary collateral branch to inhibitory interneurons. In animal model, it has been reported that the abnormal sodium channel is associated with the development of AMAN[2,5-8]. Even though AMAN usually has only axonal involvement, previous study identified the subclinical involvement of sensory nerve, which correlated with this case that showed the sural nerve involvement from nerve conduction study[9].

From previous studies, *C. jejuni* infection is associated with AMAN with hyperreflexia, but not associated with AIDP. Studies following the *C. jejuni* infection found that the anti-ganglioside antibodies are being produced. Amongst those, the specific types for AMAN are anti-GM1 and anti-GD1a[2,5-8]. In regard to our hospital limitations, neither the specific examinations for the presence of *C. jejuni* infection nor the anti-ganglioside antibodies detection was carried out to prove the hypothesis in our patient.

Regarding clinical manifestation and prognosis in this case, the nadir phase to recovery phase was correlated with previous study of Barisic and Grkovic. It identified characteristic of GBS with cortico-spinal tract involvement in children, showed clinical of hyperreflexia presented in the early course of disease (1 to 16 days of onset of clinical symptom) and the nadir phase to recovery phase (4 to 13 months) was shorter compared to demyelinating type GBS[10]. Similar to the study of Kuwabara et al, adult patients diagnosed as axonal GBS had early clinical onset at less than two weeks with rapid clinical improvement within four weeks[6]. Even if previous studies reported correlation of *C. jejuni* infection or enteritis with hyperreflexia AMAN, the present case did not have prodrome symptom of diarrhea. This case is an example of the importance of early recognition and awareness for differential diagnosis of axonal GBS in patient with clinical generalized weakness or paraparesis with hyperreflexia, to treat and improve clinical outcome.

Conclusion

Hyperreflexia can develop in patients with peripheral nerve pathology. The GBS variant preserves deep tendon reflexes. AMAN with hyperreflexia should be considered in cases of paraparesis with hyperreflexia.

What is already known on this topic?

GBS is a polyneuropathy disorder with many variants. The common clinical manifestation of GBS is known to be generalized weakness and hyporeflexia with sensory loss. Unlike the common presentation of GBS, AMAN, as a variant of GBS, manifests preserves sensory symptom, has weakness, and hyperreflexia without any evidence of upper motor neuron involvement. This condition is very rare, especially in children. Furthermore, there are only few reports of AMAN with hyperreflexia in adult patients.

What this study adds?

This study reported a rare case of AMAN with hyperreflexia in children. This study suggests the consideration of AMAN in pediatric patients when their symptoms (generalized weakness or paraparesis with hyperreflexia) could not be explained by the upper motor neuron lesion.

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Potential conflicts of interest

None.

References

1. Winer JB. Guillain-Barré syndrome: clinical variants and their pathogenesis. J Neuroimmunol 2011; 231: 70-2.
2. Kuwabara S, Yuki N. Axonal Guillain-Barré syndrome: concepts and controversies. Lancet Neurol 2013; 12: 1180-8.
3. Hughes RA, Hadden RD, Gregson NA, Smith KJ. Pathogenesis of Guillain-Barré syndrome. J Neuroimmunol 1999; 100: 74-97.
4. Ho TW, Hsieh ST, Nachamkin I, Willison HJ,

Sheikh K, Kiehlbauch J, et al. Motor nerve terminal degeneration provides a potential mechanism for rapid recovery in acute motor axonal neuropathy after Campylobacter infection. Neurology 1997; 48: 717-24.
5. Kim JK, Kim DS, Kusunoki S, Kim SJ, Yoo BG. Acute pure motor demyelinating neuropathy with hyperreflexia and anti-GalNAc-GD1a antibodies. Clin Neurol Neurosurg 2012; 114: 1345-7.
6. Kuwabara S, Nakata M, Sung JY, Mori M, Kato N, Hattori T, et al. Hyperreflexia in axonal Guillain-Barré syndrome subsequent to *Campylobacter jejuni* enteritis. J Neurol Sci 2002; 199: 89-92.
7. Nardone R, Christova M, Bratti A, Lochner P, Covi M, Trinka E, et al. Corticospinal tract dysfunction in a patient with acute motor axonal neuropathy (AMAN). Clin Neurol Neurosurg 2011; 113: 779-81.
8. Lugaresi A, Ragno M, Torrieri F, Di Guglielmo G, Fermani P, Uncini A. Acute motor axonal neuropathy with high titer IgG and IgA anti-GD1a antibodies following Campylobacter enteritis. J Neurol Sci 1997; 147: 193-200.
9. Capasso M, Notturno F, Manzoli C, Uncini A. Involvement of sensory fibres in axonal subtypes of Guillain-Barré syndrome. J Neurol Neurosurg Psychiatry 2011; 82: 664-70.
10. Barisic N, Grkovic L. Long term clinical and electrophysiological assessment of Croatian children with corticospinal tract involvement in Guillain-Barré syndrome (GBS). Eur J Paediatr Neurol 2010; 14: 391-9.

ภาวะ acute motor axonal neuropathy ที่ตรวจพบ hyperreflexia ในผู้ป่วยเด็ก: รายงายผู้ป่วย

วิชญาภรณ์ เอมราช แซ่โง้ว

Acute motor axonal neuropathy (AMAN) เป็นหนึ่งในภาวะของ Guillain-Barré syndrome (GBS) ซึ่งมีอาการทางระบบประสาท คือ อาการอ่อนแรงทั้งตัว หรือ อ่อนแรงของขาสองข้าง และตรวจพบ hyporeflexia ซึ่งในการศึกษานี้ได้รายงานผู้ป่วยเด็กชาย อายุ 1 ปี 11 เดือน มาด้วยอาการขาอ่อนแรงสองข้างมา 2 สัปดาห์ โดยมีอาการไข้ไอมีน้ำมูก 4 สัปดาห์ก่อนมีอาการอ่อนแรง ตรวจร่างกายพบขาอ่อนแรงสองข้าง และตรวจพบ hyperreflexia ในตอนแรกคิดถึงพยาธิสภาพที่ไขสันหลัง จึงได้ทำ MRI ไขสันหลังแต่ไม่พบความผิดปกติจึงได้ทำการเจาะหลัง และผลของน้ำไขสันหลังพบลักษณะผิดปกติที่เข้าได้กับภาวะ cytoalbumino dissociation คือ ไม่พบเม็ดเลือดขาวในน้ำไขสันหลังแต่พบโปรตีนสูง ซึ่งพบได้ในภาวะ GBS และได้ทำการตรวจทางเส้นประสาท (nerve conduction study) พบความผิดปกติที่เข้าได้กับรูปแบบของ AMAN เนื่องจากผู้ป่วยรายนี้อาการเริ่มดีขึ้นเองจึงไม่ได้ให้ยา intravenous immunoglobulin (IVIG) และผู้ป่วยสามารถเดินได้ปกติที่หลังจากมีอาการอ่อนแรง 8 สัปดาห์ จากการศึกษานี้จึงสนับสนุนว่า ควรคิดถึงภาวะ GBS ในผู้ป่วยที่มาด้วยอาการอ่อนแรงและตรวจร่างกายพบ hyperreflexia ที่ไม่อธิบายได้ด้วยพยาธิสภาพที่ไขสันหลังหรือสมอง